

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF STATISTICS.

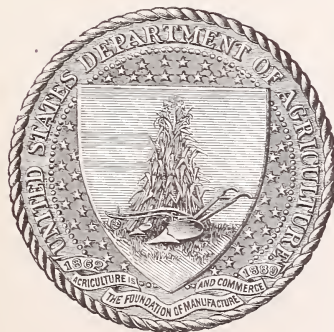
THE FERTILIZER INDUSTRY:

REVIEW OF STATISTICS OF PRODUCTION AND CONSUMPTION,
WITH ABSTRACTS OF STATE LAWS FOR
ANALYSIS AND SALE.

COMPILED UNDER THE DIRECTION OF

JOHN HYDE,

STATISTICIAN.



WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1898.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE STATISTICIAN,
Washington, D. C., March 14, 1898.

SIR: I have the honor to transmit herewith a report on the consumption of fertilizers in the United States, prepared by Mr. George K. Holmes, Assistant Statistician.

Occupying relatively only a small space in the report, but forming perhaps its most interesting and valuable feature, is a statement of certain significant facts that have been brought out in the course of an investigation, now approaching completion in the Division of Statistics, as to the cost of raising a bale of cotton. It is shown statistically that, under ordinary conditions, the larger the expenditure on fertilizers, the larger the net profit accruing to the planter.

Acknowledgment is due to the fertilizer inspection officials of the various States having inspection laws, for their valuable assistance in procuring information as to quantity and value of fertilizers consumed.

Respectfully,

JOHN HYDE, *Statistician.*

Hon. JAMES WILSON,
Secretary of Agriculture.

CONTENTS.

	Page.
Review of production and consumption of fertilizers	5
Lack of statistics on production.....	5
Consumption of fertilizers	5
Quantity	5
Value	6
Report in detail for New Jersey	6
Returns for census years	8
Production of fertilizers in 1890.....	8
Production of phosphate.....	10
Production and consumption of phosphate for the world.....	12
Imports and exports of fertilizers	13
Average value per ton.....	13
Fertilizers and profit in cotton raising.....	16
Increase of profit with increase of fertilizers	17
Losses by use of fertilizers.....	17
Analysis of fertilizers and license of sales	20
The general system	20
Abstract of fertilizer laws	20
Alabama.....	20
Arkansas	21
Connecticut	21
Delaware.....	21
Florida	21
Georgia	22
Illinois	22
Indiana	22
Kentucky.....	22
Louisiana	22
Maine	23
Maryland.....	23
Massachusetts	23
Michigan	23
Mississippi	24
Missouri	24
New Hampshire.....	24
New Jersey	24
New York	24
North Carolina	25
Ohio	25
Pennsylvania.....	25
Rhode Island	25
South Carolina	25
Tennessee	26
Vermont.....	26
Virginia	26
West Virginia	26
Wisconsin	26
Titles and addresses of fertilizer-inspection officials	27

THE FERTILIZER INDUSTRY.

REVIEW OF PRODUCTION AND CONSUMPTION OF FERTILIZERS.

LACK OF STATISTICS ON PRODUCTION.

Since the census of 1890 several attempts have been made to ascertain from the manufacturers of commercial fertilizers the quantity manufactured during a preceding year, but these attempts have been abortive through the indifference and in some cases the positive unwillingness of manufacturers to furnish the information desired. Only a small percentage of the entire number addressed made a satisfactory response. It is therefore impossible to state for any year subsequent to the last census year (1890) what the production of commercial fertilizers has been.

The number of establishments that manufacture fertilizers is not precisely known, but from an examination of the lists of manufacturers who have obtained licenses for the sale of fertilizers in the various States, eliminating duplicates, those who have gone out of business, and mere dealers, it would appear that the total is about 700. In 1890 the census reported the number to be 390; in 1880, 364. Since 1890 there has been a very considerable development in the manufacture of fertilizers, especially in South Carolina and Florida, where phosphate mining has assumed large proportions.

CONSUMPTION OF FERTILIZERS.

With respect to consumption, however, the case is different, and it has been possible, with the aid of State fertilizer inspectors and other State officials, to ascertain approximately the quantity and value of the commercial fertilizers consumed in the United States in the calendar year 1896.

The total consumption of fertilizers, by States and for a series of years, more or less complete, from 1891 to 1897, is shown in Table 1 and the value of these fertilizers in Table 2.

It is to be understood that only commercial fertilizers are included in these tables, or in any of the tables of this report.

QUANTITY.

Only one year (1896) is complete for all States, and during that year 1,894,917 tons of fertilizers were consumed, valued at the factory at \$37,688,869, which is considerably less than the amount paid by farmers.

Georgia is by far the principal user of fertilizers among the States, the quantity used in that State in 1896 being 335,618 tons. South Carolina stands second, with 199,497 tons; North Carolina third, with 187,429 tons; Virginia fourth, with 171,704 tons; New York and Pennsylvania fifth and sixth, each with 150,000 tons, approximately; and Alabama seventh, with an approximate consumption of 100,000 tons.

VALUE.

With respect to the values of the amounts consumed these States do not stand in the same order. Georgia still leads with a value of \$4,698,652; but New York is second, with \$4,691,500; Virginia is third, with \$4,034,944; Pennsylvania is fourth, with \$3,750,000; North Carolina is fifth, with \$2,811,435; and South Carolina is sixth, with \$2,792,958. Alabama, although consuming a larger amount of fertilizer than New Jersey, and probably Maryland also, is below both of these States in the value of the fertilizers consumed, and is but little above the State of Ohio in this respect.

It is observable that in 1895 the farmers of the South, owing probably to financial depression and the low prices of farm products, reduced their expenditure for fertilizers, but there was an increase in 1896 and a further considerable increase in 1897. The fertilizers used in the South are cheaper than those used in the North, chiefly because the South uses more phosphates, which are a local product.

Statistics of the consumption of fertilizers have been published in reports of two censuses, those of 1880 and 1890, but these statistics disclose only the value of the fertilizers consumed. It may be found that for certain States the values given in Table 2 for 1896 are less than those given in the census of 1890, but it does not necessarily follow from this that there was a smaller consumption of fertilizers in 1896 than at the census of 1890, because the factory value of fertilizers has been a declining one since the former year, and furthermore the census values are retailers' values.

REPORT IN DETAIL FOR NEW JERSEY.

It has been impossible to ascertain the consumption of the different kinds of fertilizers for any of the States except New Jersey, for which the number of tons consumed in 1896 may be stated as follows:

Amount of fertilizer used in New Jersey in 1896.

Kinds of fertilizer:	Tons.
Complete manure	43,331
Ammoniated superphosphate without potash (dissolved bone, etc.).....	1,458
Ground bone.....	3,014
Kainit.....	1,797
Muriate of potash	861
Sulphate of potash	17
Ammonite (including blood)	655
Ammonium sulphate	70
Sodium nitrate	345
Fish.....	786
Hair.....	75

Kinds of fertilizer—Continued.

Tons.

Cotton-seed meal	3
Boneblack superphosphate	312
South Carolina rock superphosphate	3, 631
Total	56, 355

TABLE I.—Tons of commercial fertilizers consumed in the United States, by States, 1891 to 1897.

[Tons of 2,000 pounds.]

States.	1891.	1892.	1893.	1894.	1895.	1896.	1897, to Oct. 1.
Vermont	9, 000	9, 500	10, 000	11, 000	12, 000	13, 000	14, 000
Connecticut				22, 500		20, 000	
New York		90, 333				150, 000	
New Jersey	43, 414	47, 654	51, 758	53, 469	51, 149	56, 355	
Pennsylvania		128, 000	150, 000	150, 000	150, 000	150, 000	150, 000
Virginia	114, 119	142, 826	152, 082	156, 582	156, 700	171, 704	
North Carolina	150, 000	104, 178	145, 466	131, 243	111, 208	187, 429	203, 097
South Carolina	212, 393	144, 385	200, 372	173, 996	120, 311	199, 497	240, 000
Georgia	306, 734	296, 342	307, 519	315, 612	226, 532	335, 618	401, 979
Florida	36, 367	37, 560	40, 342	44, 065	16, 342	26, 389	20, 149
Alabama	115, 785	84, 009	104, 256			100, 000	96, 154
Mississippi			25, 050	23, 880	19, 075	32, 270	42, 550
Louisiana		7, 945	12, 047	8, 496	4, 783	10, 051	12, 542
Arkansas							1, 000
Tennessee	13, 763	15, 909				19, 445	25, 883
West Virginia		25, 000			21, 559	28, 433	25, 335
Kentucky	9, 500	12, 050	15, 850	16, 200	17, 950	19, 550	18, 500
Ohio	45, 435	47, 244	44, 140	45, 645	63, 149	51, 192	
Michigan						3, 500	
Indiana	26, 750	35, 000	38, 000	35, 000	45, 300	41, 900	
Wisconsin						200	
Missouri						2, 000	
Utah						5, 530	
Total						1, 624, 063	
Rest of United States(a)						270, 854	
Grand total						1, 894, 917	

a Purchases for farm use as reported in census of 1890, at average value for 1896, as shown by this Table and Table 3.

TABLE 2.—Value of commercial fertilizers consumed in the United States, by States, 1891 to 1897.

[Tons of 2,000 pounds.]

States.	1891.	1892.	1893.	1894.	1895.	1896.	1897, to Oct. 1.
Vermont	\$298, 260	\$308, 465	\$323, 200	\$346, 170	\$370, 800	\$401, 700	\$408, 660
Connecticut				675, 000		600, 000	
New York		2, 862, 653				4, 621, 500	
New Jersey	1, 346, 482	1, 509, 921	1, 641, 615	1, 715, 767	1, 575, 840	1, 736, 298	
Pennsylvania		3, 200, 000	3, 750, 000	3, 750, 000	3, 750, 000	3, 750, 000	3, 750, 000
Virginia	1, 711, 785	2, 142, 390	2, 281, 230	3, 914, 550	3, 914, 550	4, 034, 944	
North Carolina	2, 250, 000	1, 562, 670	2, 181, 990	1, 968, 645	1, 668, 120	2, 811, 435	3, 046, 455
South Carolina	3, 185, 895	2, 165, 775	3, 005, 500	2, 609, 940	1, 804, 665	2, 792, 958	3, 120, 000
Georgia	4, 601, 010	4, 445, 130	4, 612, 785	4, 734, 180	3, 397, 980	4, 698, 652	5, 225, 727
Florida	618, 239	638, 520	724, 156	710, 844	326, 840	520, 558	443, 278
Alabama	1, 736, 775	1, 260, 135	1, 563, 840			1, 400, 000	1, 250, 000
Mississippi			443, 980	425, 115	339, 674	575, 234	752, 238
Louisiana		146, 982	222, 870	157, 176	88, 486	165, 842	206, 943
Arkansas							20, 000
Tennessee	344, 075	397, 725				486, 125	647, 075
West Virginia		625, 000			419, 604	574, 665	532, 164
Kentucky	237, 500	301, 250	396, 250	405, 000	448, 750	488, 750	462, 500
Ohio	1, 135, 875	1, 181, 100	1, 103, 500	1, 141, 125	1, 578, 725	1, 279, 800	
Michigan						a 87, 500	
Indiana	668, 750	1, 000, 000	950, 000	875, 000	1, 132, 500	1, 047, 500	
Wisconsin						6, 000	
Missouri						51, 500	
Utah						110, 621	
Total						32, 301, 582	
Rest of United States(a)						5, 387, 287	
Grand total						37, 688, 869	

a Purchases for farm use as reported in census of 1890.

RETURNS FOR CENSUS YEARS.

It is thought desirable to republish from the census reports of 1880 and 1890 the value of the fertilizers purchased by farmers within the year preceding June 1 of each of those years. These statistics may be found in Table 3.

The retail value of the fertilizers bought in 1880 was \$28,586,397; in 1890, \$38,469,598, or but slightly more than the wholesale value for 1896, shown in Table 2. The South Atlantic States lead all other geographical divisions in the value of fertilizers consumed, the North Atlantic stand second in order, and the South Central third.

TABLE 3.—*Value of fertilizers purchased, 1880 and 1890, by States and Territories.*

States and Territories.	1880.	1890.	States and Territories.	1880.	1890.
Maine.....	\$212, 135	\$456, 515	Minnesota.....	\$93, 250	\$61, 578
New Hampshire.....	165, 393	246, 293	Iowa.....	98, 567	86, 843
Vermont.....	127, 670	217, 397	Missouri.....	109, 724	65, 705
Massachusetts.....	653, 422	896, 560	Kansas.....	61, 713	25, 740
Rhode Island.....	140, 318	172, 900	Nebraska.....	20, 794	19, 269
Connecticut.....	497, 448	609, 649	South Dakota.....	.....	15, 675
New York.....	2, 715, 477	3, 627, 726	North Dakota.....	.....	8, 923
New Jersey.....	1, 601, 609	1, 837, 719	Montana.....	.....	4, 757
Pennsylvania.....	3, 525, 336	3, 384, 310	Wyoming.....	.....	1, 548
Delaware.....	467, 228	460, 465	Colorado.....	5, 195	25, 074
Maryland.....	2, 838, 465	2, 419, 826	New Mexico.....	10, 733	9, 217
District of Columbia.....	22, 352	16, 651	Arizona.....	.....	10
Virginia.....	2, 137, 283	2, 320, 260	Utah.....	11, 394	23, 211
North Carolina.....	2, 111, 767	2, 882, 238	Nevada.....	2, 526	2, 019
South Carolina.....	2, 659, 969	3, 867, 418	Idaho.....	.....	2, 137
Georgia.....	4, 346, 920	5, 724, 187	Washington.....	.....	11, 633
Florida.....	72, 642	857, 327	Oregon.....	10, 519	13, 370
Alabama.....	1, 200, 956	2, 421, 648	California.....	108, 732	148, 886
Mississippi.....	123, 253	789, 268	Oklahoma.....	.....	3, 817
Louisiana.....	278, 305	906, 348			
Texas.....	74, 797	58, 665	The United States...	28, 586, 397	38, 469, 598
Arkansas.....	56, 314	93, 939			
Tennessee.....	157, 442	361, 097	SUMMARY BY GEOGRAPHICAL DIVISIONS.		
West Virginia.....	176, 300	210, 767			
Kentucky.....	145, 674	317, 231	North Atlantic.....	9, 638, 808	11, 449, 069
Ohio.....	550, 029	1, 602, 869	South Atlantic.....	14, 832, 926	18, 759, 139
Michigan.....	300, 995	173, 017	North Central.....	1, 928, 823	3, 067, 515
Indiana.....	340, 582	777, 727	South Central.....	2, 035, 741	4, 952, 013
Illinois.....	174, 277	124, 977	Western.....	149, 099	241, 862
Wisconsin.....	178, 892	105, 192			

PRODUCTION OF FERTILIZERS IN 1890.

The latest information with regard to the manufacture of fertilizers is shown in Table 4, which is taken from one of the reports of the census of 1890. This table includes fertilizers generally understood as such, but does not include chemicals used in the manufacture of fertilizers. This industry is one in which the value of materials forms an unusually large percentage of the value of the product, since it constitutes 64.1 per cent of that value, while in the case of all manufactures, taken collectively, the percentage is only 55.8.

The census report states that the apparent profit disclosed by this table is not a net profit, but is a gross profit, from which there remain to be deducted certain expenses which are not included in the column of "Miscellaneous expenses." If wages and salaries, cost of materials, and miscellaneous expenses are deducted from the value of products, a gross profit of 16.3 per cent is shown on the value of the capital.

TABLE 4a.—*Manufactures of fertilizers, 1890, by States and Territories.*

States and Territories.	Number of establishments reporting.	Capital.					Live assets.
		Aggregate.	Plant.			Machinery, tools, and implements.	
			Total.	Land.	Buildings.		
Alabama	8	\$709,250	\$175,700	\$7,100	\$74,500	\$94,100	\$533,550
California	4	230,500	72,500	19,000	15,000	38,500	158,000
Connecticut	8	246,223	164,000	29,800	72,000	62,200	82,223
Delaware	17	1,011,589	351,275	61,875	175,500	113,900	660,314
District of Columbia	3	73,570	15,380	3,000	2,000	10,380	58,190
Florida	3	14,705	5,500	300	3,450	1,750	9,205
Georgia	44	5,501,881	1,701,587	241,516	824,713	635,358	3,800,294
Illinois	4	914,844	251,749	55,867	102,582	93,300	663,095
Indiana	5	86,120	23,050	6,500	8,650	7,900	63,070
Kentucky	4	234,585	79,500	29,000	32,000	18,500	155,085
Louisiana	3	582,347	135,000	21,000	66,500	47,500	447,347
Maine	6	74,530	20,490	3,400	4,300	12,790	54,040
Maryland	53	6,935,914	1,843,383	430,075	852,100	561,208	5,092,531
Massachusetts	16	1,720,605	165,000	18,500	66,350	80,150	1,555,605
Michigan	3	673,900	291,800	19,000	101,100	171,700	382,100
Mississippi	3	180,532	42,690	8,000	17,600	17,060	137,932
Missouri	4	209,658	112,835	15,159	41,890	55,786	96,823
New Jersey	27	3,705,914	1,425,296	332,350	605,682	487,264	2,280,618
New York	31	3,895,779	1,078,212	220,784	531,800	325,628	2,317,567
North Carolina	12	1,513,142	382,652	31,857	192,300	158,495	1,130,490
Ohio	22	1,182,510	464,650	105,302	183,196	176,152	717,860
Pennsylvania	49	2,719,898	1,476,061	612,364	411,183	452,514	1,243,837
South Carolina	20	5,920,218	2,215,289	444,400	1,055,783	715,106	3,704,929
Tennessee	4	380,191	134,764	33,000	78,511	23,253	245,427
Virginia	28	1,795,303	525,200	117,300	245,850	162,050	1,270,103
All other States and Territories	9	80,460	44,150	4,050	23,200	16,900	36,310
The United States	390	40,594,168	13,197,623	2,870,499	5,787,740	4,539,384	27,396,545

TABLE 4b.—*Manufactures of fertilizers, 1890, by States and Territories.*

States and Territories.	Value of products.	Cost of materials used.	Miscellaneous expenses.	Total wages.
Alabama	\$765,000	\$519,713	\$48,715	\$60,310
California	234,500	179,975	17,938	52,408
Connecticut	330,450	247,912	17,904	42,625
Delaware	1,018,438	696,185	31,277	81,068
District of Columbia	93,300	76,700	4,995	11,450
Florida	86,137	74,075	1,059	9,905
Georgia	5,026,034	3,098,883	468,599	484,589
Illinois	924,758	297,685	53,226	200,574
Indiana	216,812	156,945	7,215	10,592
Kentucky	256,169	172,869	15,382	31,665
Louisiana	263,678	157,703	24,919	59,598
Maine	69,020	41,603	4,354	12,970
Maryland	6,208,025	3,984,178	459,109	711,548
Massachusetts	1,910,920	1,119,951	54,910	204,427
Michigan	753,585	594,767	53,979	81,400
Mississippi	326,650	277,005	6,650	13,248
Missouri	212,716	124,823	14,362	49,416
New Jersey	4,319,083	2,882,809	186,485	591,208
New York	3,498,291	2,138,915	217,514	483,717
North Carolina	994,135	656,769	89,316	119,494
Ohio	1,287,101	840,787	73,413	191,029
Pennsylvania	2,957,316	2,032,218	304,660	344,238
South Carolina	4,417,658	2,754,407	490,335	492,015
Tennessee	267,900	151,100	44,320	29,100
Virginia	2,475,638	1,739,138	84,556	260,939
All other States and Territories	217,525	96,759	14,890	36,298
The United States	39,180,844	25,113,874	2,790,082	4,671,831

TABLE 4c.—*Manufactures of fertilizers, 1890, by States and Territories.*

States and Territories.	Average number of employees and total wages.											
	Aggregates.		Officers, firm members, and clerks.				Operatives, skilled and unskilled.					
			Males above 16 years.		Females above 15 years.		Males above 16 years.		Females above 15 years.		Children.	
	Average number.	Total wages.	No.	Wages.	No.	Wages.	No.	Wages.	No.	Wages.	No.	Wages.
Alabama	251	\$69, 310	21	\$17, 475			230	\$42, 835				
California	117	52, 408	6	7, 680			111	44, 728				
Connecticut	150	42, 625	14	9, 268			134	32, 772	2	\$585		
Delaware	209	81, 068	22	14, 735			187	66, 333				
Dist. Columbia	31	11, 450	2	1, 664			29	9, 786				
Florida	28	9, 905	5	5, 600			23	4, 305				
Georgia	1, 428	484, 589	164	158, 578			1, 255	324, 479	4	1, 248	5	\$284
Illinois	278	200, 574	30	57, 979			248	142, 595				
Indiana	32	16, 592	6	7, 130			26	9, 462				
Kentucky	62	31, 665	16	12, 491	1	\$700	45	18, 474				
Louisiana	105	59, 598	7	22, 350			88	34, 908	10	2, 340		
Maine	44	12, 970	8	4, 030			36	8, 940				
Maryland	1, 232	711, 548	179	218, 216	2	650	1, 047	490, 602	4	2, 080		
Massachusetts	381	204, 427	29	36, 576			351	167, 676	1	175		
Michigan	210	81, 400	14	13, 220	1	380	185	66, 760			10	1, 040
Mississippi	58	13, 248	6	2, 100			52	11, 148				
Missouri	95	49, 416	7	8, 800			87	40, 382	1	234		
New Jersey	1, 088	591, 208	123	138, 481	2	1, 205	927	440, 686	36	10, 836		
New York	800	483, 717	110	158, 711			686	324, 390	2	416	2	200
North Carolina	374	119, 494	29	29, 092	2	542	333	87, 960			10	1, 900
Ohio	381	191, 029	53	40, 427			327	150, 507			1	95
Pennsylvania	745	344, 238	89	67, 299			641	274, 175	2	1, 000	13	1, 764
South Carolina	1, 182	492, 015	80	105, 630			1, 101	386, 350			1	35
Tennessee	78	29, 100	7	7, 500	1	600	56	16, 000	14	5, 000		
Virginia	687	260, 939	86	96, 872	1	300	600	163, 767				
All others	112	36, 298	9	7, 680			58	21, 870	12	2, 000	33	4, 748
United States	10, 158	4, 671, 831	1, 122	1, 249, 584	10	4, 377	8, 863	3, 381, 890	88	25, 914	75	10, 066

PRODUCTION OF PHOSPHATE.

While the output of fertilizers as a whole is unknown for any year since 1890, yet statistics with regard to the phosphate industry for 1891 and 1892 have been published by the Department of Labor, and for 1891 to 1896 by the Geological Survey. The Department of Labor obtained its statistics by sending a special agent to the phosphate mines, where he entered upon schedules the information which that Department has since published. The method employed by the Geological Survey is to obtain information by means of the mail, addressing all operating phosphate miners whose names can be ascertained, and the endeavor is made to make the list complete.

Tables 5 and 6, relating to phosphate production, are taken respectively from reports of the Department of Labor and the Geological Survey. They differ in their statements, and there are no facts available as an explanation of the differences beyond a statement of the methods employed in collecting the statistics.

TABLE 5.—Quantity and value of phosphate mined, acres controlled, capital invested, and number and wages of employees.

[From the special report of the Commissioner of Labor on The Phosphate Industry of the United States, page 91. The period covered by the table is the last obtainable complete fiscal year each mine was operated between 1890 and 1892, inclusive.]

Locality and number of mines.	Phosphate mined.			Controlled for mining purposes.		Capital invested in—		Expenditure for labor.	Employees engaged in production.	
	Quantity (tons of 2,240 pounds).	Value at mine.	Quantity shipped (tons of 2,240 pounds).	Acres.	Miles of river.	Plant.	Land.		Average number.	Average yearly earnings.
<i>Florida.</i>										
88 land mines.	371,190	\$2,186,153	268,718	179,848	.....	a\$1,329,582	b\$9,600,067	c\$737,557	d3,499	\$211
18 river mines.	160,837	635,696	151,715	.....	a 163½	e 811,000	a 1,746,000	144,154	416	347
Total ...	532,027	2,821,849	420,433	179,848	a 163½	f 2,140,582	g 11,346,067	c 881,711	d 3,915	225
<i>N. Carolina.</i>										
1 land mine ..	700	2,800	700	2,500	.....	2,000	100,000	1,215	18	68
<i>S. Carolina.</i>										
23 land mines.	429,976	2,641,992	379,276	69,790	.....	1,272,000	f 2,865,000	e 1,239,491	h 4,314	287
7 river mines.	269,000	1,686,500	233,000	.....	f 7	1,291,200	55,000	c 351,198	h 928	378
Total ...	698,976	4,328,492	612,276	69,790	f 7	2,563,200	f 2,920,000	k 1,590,689	l 5,242	303
Grand total ...	1,231,003	7,153,141	1,033,409	252,138	m 170½	f 4,705,782	n 14,366,067	o 2,473,615	p 9,175	270

a Not including 3 mines not reporting.
b Not including 8 mines not reporting.
c Including the expenditures for officials and clerks in 1 mine.
d Not including 1 mine not reporting.
e Not including 2 mines not reporting.
f Not including 5 mines not reporting.
g Not including 11 mines not reporting.
h Not including skilled labor in 1 mine not reporting.
i Not including 1 mine with a product of 600 tons not reporting.

j Not including 6 mines not reporting.
k Including the expenditures for officials and clerks in 2 mines.
l Not including skilled labor in 2 mines not reporting.
m Not including 9 mines not reporting.
n Not including 16 mines not reporting.
o Including the expenditures for officials and clerks in 3 mines.
p Not including all labor in 1 mine and skilled labor in 2 mines not reporting.

TABLE 6.—Production of phosphate rock, 1891 to 1896.

[From the Eighteenth Annual Report of the United States Geological Survey, 1896-97.]

State.	1891.		1892.		1893.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
<i>Florida:</i>	<i>Long tons.</i>		<i>Long tons.</i>		<i>Long tons.</i>	
Hard rock	57,982	.....	a 155,908	\$859,276	215,685	\$1,117,732
Soft rock			6,710	32,418	13,675	64,626
Land pebble			21,905	111,271	86,624	359,127
River pebble	54,500	.....	b 102,820	415,453	122,820	437,571
Total	112,482	\$703,013	287,343	1,418,418	438,804	1,979,056
<i>South Carolina:</i>						
Land rock	344,978	2,187,160	243,653	1,236,447	308,435	1,408,785
River rock	130,528	760,978	150,575	641,262	194,129	748,229
Total	475,506	2,948,138	394,228	1,877,709	502,564	2,157,014
Grand total	587,988	3,651,151	681,571	3,296,127	941,368	4,136,070

a Includes 52,708 tons of land rock carried over in stock from 1891.

b Includes 12,120 tons of river pebble carried over in stock from 1891.

TABLE 6.—*Production of phosphate rock, 1891 to 1896—Continued.*

State.	1894.		1895.		1896.	
Florida:	<i>Long tons.</i>		<i>Long tons.</i>		<i>Long tons.</i>	
Hard rock	326,461	\$979,383	307,098	\$1,302,096	296,811	\$1,067,525
Soft rock			6,916	32,900	400	2,300
Land pebble	98,885	296,655	181,011	593,716	97,936	176,972
River pebble	102,307	390,775	73,036	185,090	100,052	300,556
Total	527,653	1,666,813	568,061	2,112,902	495,199	1,547,353
South Carolina:						
Land rock	307,305	1,252,768	270,560	898,787	267,072	792,457
River rock	142,803	492,808	161,415	512,245	135,351	389,192
Total	450,108	1,745,576	431,975	1,411,032	402,423	1,181,649
Tennessee	19,188	67,158	38,515	82,160	26,157	57,370
North Carolina					7,000	17,000
Grand total	996,949	3,479,547	1,038,551	3,606,094	930,779	2,803,372

PRODUCTION AND CONSUMPTION OF PHOSPHATE FOR THE WORLD.

The world's production and consumption of phosphate are shown in Table 7, which is taken from the Special Report of the Commissioner of Labor on the Phosphate Industry, pages 101–102.

It appears that in 1891 the production of phosphate in the world was 1,587,133½ tons, the statements for all foreign countries being, however, in round numbers. France stands next to the United States in production, and Belgium third. The consumption is shown to be very nearly equal to the production; the United States leading with 517,187 tons, the United Kingdom following with 300,000 tons, and Germany with 250,000 tons.

The estimates for foreign countries given here were made by Mr. Hermann Voss. Another estimate of consumption, which the Commissioner of Labor regards as more trustworthy, makes the total for those countries 1,069,946½ tons instead of 1,030,000 tons, as here given. This would make the world's consumption 1,587,133½ tons in 1891.

TABLE 7.—*The world's production of phosphate, 1891.*

[Tons of 2,240 pounds.]

Countries producing.	Tons.
The United States	757,133½
France—Somme and Ardennes	400,000
West Indies—Aruba, etc.	50,000
Belgium—Mons and Liege	200,000
Canada	20,000
Germany—Lahn	40,000
England (coprolites)	20,000
Russia, Norway, and other countries	100,000
Total	1,587,133½

The world's consumption of phosphate, 1891.

[Tons of 2,240 pounds.]

Countries consuming.	Tons.
The United States	517,187
United Kingdom of Great Britain	300,000
Germany	250,000
France	150,000
France (in the raw state)	200,000
Belgium and Holland	75,000
Other countries	55,000
Total	1,547,187

IMPORTS AND EXPORTS OF FERTILIZERS.

The Bureau of Statistics of the Treasury Department has obtained statistics of the imports and exports of fertilizers and fertilizer materials for a series of thirteen years, from 1884 to 1896. The quantities of fertilizers can not be ascertained in all cases, but all fertilizers are represented for value. Table 8 shows the imports and Table 9 the exports.

It appears that 375,733.93 tons of fertilizers were imported during 1896, not including fertilizers for which tonnage is not given, and that the total value of all fertilizers imported in that year, including those for which tonnage is not given, was \$7,376,615.

AVERAGE VALUE PER TON.

The average value per ton imported and exported is given in Tables 8 and 9, and in these tables it appears that the average ton imported, not including fertilizers whose tonnage is not given, was valued in 1896 at \$19.04, while the exported ton was valued at \$8.56. The tons of fertilizers exported in 1896 were 514,143, and the value of all fertilizers exported, whether expressed in tons or not, was \$4,400,593.

TABLE 8.—Imports of fertilizers and fertilizer materials, 1884 to 1896.

Articles.	Year.	Tons.	Value.	Value per ton.
Ammonia, sulphate of	1884	0.06	\$8	\$133.33
	1885	1.56	19	12.18
	1886	1,116.41	50,482	45.22
	1887	426.06	17,275	40.55
	1888	32.76	1,553	47.41
	1889	89.57	4,272	47.69
	1890	143.76	7,175	49.91
	1891	9,904.32	483,196	48.79
	1892	4,953.30	236,085	47.66
	1893	7,012.88	315,802	45.03
	1894	2,170.50	125,869	57.99
	1895	7,137.49	358,238	50.19
	1896	12,270.70	480,971	39.20
Apatite.....	1885	891.00	8,466	9.50
	1887	360.00	4,342	12.06
	1890	126.00	1,297	10.29
	1892	37.50	653	17.41
	1893	64.00	1,021	15.95
	1894	165.00	1,239	7.51
	1895	121.00	2,124	17.55
	1896	434.00	3,030	6.98
Ashes, wood and lye of, and beet-root ashes.....	1884	.....	19,717	.....
	1885	.....	23,238	.....
	1886	.....	28,022	.....
	1887	.....	36,283	.....

TABLE 8.—Imports of fertilizers and fertilizer materials, 1884 to 1896—Continued.

Articles.	Year.	Tons.	Value.	Value per ton.
Ashes, wood and lye of, and beet-root ashes.....	1888	.....	\$44,592	.....
	1889	.....	38,989	.....
	1890	.....	40,698	.....
	1891	.....	42,624	.....
	1892	.....	54,855	.....
	1893	.....	76,306	.....
	1894	.....	74,050	.....
	1895	.....	77,708	.....
	1896	.....	67,394	.....
	1884	.....	4,356	.....
Blood, dried	1887	.....	5,003	.....
	1888	.....	2,743	.....
	1889	.....	3,955	.....
	1890	.....	1,338	.....
	1891	.....	1,594	.....
	1892	.....	1,397	.....
	1893	.....	72,684	.....
	1894	.....	4,068	.....
	1895	.....	1,014	.....
	1884	.....	.....	.....
Bone dust or animal carbon, and bone ash, fit only for fertilizing purposes.....	1885	8,734.43	183,553	\$21.01
	1886	6,861.42	115,437	16.82
	1887	21,235.01	351,390	16.55
	1888	22,314.97	412,926	18.50
	1889	1,605.14	22,056	13.74
	1890	4,585.69	57,447	12.53
	1891	3,219.12	59,095	18.36
	1892	6,614.00	122,717	18.55
	1893	6,587.95	128,398	19.49
	1894	7,875.00	152,642	19.38
Bones, crude, not manufactured, burned, calcined, ground or steamed.....	1895	3,378.00	44,747	13.25
	1896	3,195.00	41,777	13.08
	1884	2,983.00	37,992	12.74
	1885	.....	191,505	.....
	1886	.....	162,985	.....
	1887	.....	310,731	.....
	1888	.....	59,244	.....
	1889	.....	195,979	.....
	1890	.....	318,351	.....
	1891	.....	345,511	.....
Cotton-seed meal and cake.....	1892	.....	332,911	.....
	1893	.....	348,310	.....
	1894	.....	360,305	.....
	1895	.....	301,554	.....
	1896	.....	305,043	.....
	1884	.....	154,610	.....
	1885	.....	.....	.....
	1886	.....	.....	.....
	1887	.....	.....	.....
	1888	.....	.....	.....
Guano	1889	.....	.....	.....
	1890	.....	.....	.....
	1891	.....	.....	.....
	1892	.....	.....	.....
	1893	.....	.....	.....
	1894	.....	.....	.....
	1895	.....	.....	.....
	1896	.....	.....	.....
	1884	.....	.....	.....
	1885	.....	.....	.....
Kieserite, kyanite or cyanite, and kainite.....	1886	.....	.....	.....
	1887	.....	.....	.....
	1888	.....	.....	.....
	1889	.....	.....	.....
	1890	.....	.....	.....
	1891	.....	.....	.....
	1892	.....	.....	.....
	1893	.....	.....	.....
	1894	.....	.....	.....
	1895	.....	.....	.....
Lime.....	1896	.....	.....	.....
	1884	.....	.....	.....
	1885	.....	.....	.....
	1886	.....	.....	.....
	1887	.....	.....	.....
	1888	.....	.....	.....
	1889	.....	.....	.....
	1890	.....	.....	.....
	1891	.....	.....	.....
	1892	.....	.....	.....

TABLE 8.—Imports of fertilizers and fertilizer materials, 1884 to 1896—Continued.

Articles.	Year.	Tons.	Value.	Value per ton.
Lime	1893	29,000.11	\$114,418	\$3.95
	1894	22,110.50	87,513	3.96
	1895	23,575.87	90,293	3.83
	1896	21,403.02	76,302	3.57
	1884	13.60	1,683	123.75
	1885	408.56	10,495	25.69
	1886	1,387.91	38,633	27.84
	1887	2,070.99	58,512	28.25
	1888	2,201.16	58,392	26.53
Oil cake	1889	2,167.56	52,831	24.37
	1890	1,477.09	38,577	26.12
	1891	1,337.03	23,846	17.84
	1892	5,353.56	106,811	19.95
	1893	3,641.78	82,916	22.77
	1894	3,749.76	37,170	9.91
	1895	2,255.93	47,386	14.55
	1896	8,911.50	52,867	5.93
	1884	16,542.00	237,594	14.36
	1885	21,418.56	264,079	12.33
	1886	37,980.50	432,591	11.39
	1887	26,334.04	247,911	9.41
Phosphates, crude or native	1888	28,669.76	248,427	8.67
	1889	34,407.47	333,957	9.71
	1890	31,179.33	309,764	9.93
	1891	32,882.80	287,057	8.73
	1892	26,197.00	192,733	7.36
	1893	21,526.00	130,696	6.07
	1894	28,942.00	123,714	4.27
	1895	24,130.00	159,169	6.60
	1896	20,562.29	153,370	7.46
	1884	24,356.38	731,400	30.03
	1885	20,419.85	613,674	30.05
	1886	23,412.00	721,736	30.83
	1887	19,900.30	592,432	29.77
	1888	28,032.59	822,089	29.33
	1889	36,051.56	1,067,344	29.61
Potash, muriate of	1890	31,470.35	928,457	29.50
	1891	37,927.18	1,182,007	31.17
	1892	35,210.72	1,094,122	31.07
	1893	36,693.59	1,180,044	32.16
	1894	40,832.09	1,280,795	31.37
	1895	44,754.06	1,361,218	30.42
	1896	43,438.35	1,372,743	31.60
	1884	173.17	6,227	35.96
	1885	5.94	190	31.99
	1886	325.94	10,850	33.29
	1887	998.16	38,986	39.06
	1888	723.87	27,038	37.35
Potash, sulphate of	1889	2,799.57	89,173	31.85
	1890	744.86	26,599	35.71
	1891	1,362.60	49,619	36.41
	1892	3,162.73	112,780	35.66
	1893	6,923.39	251,792	36.37
	1894	5,988.63	229,975	38.40
	1895	7,762.01	273,392	35.22
	1896	7,423.67	269,810	36.34
	1884	60,601.15	1,983,378	32.73
	1885	54,680.90	1,696,056	31.02
	1886	50,608.11	1,681,824	33.23
	1887	86,145.96	2,614,162	30.35
Soda, nitrate of, or cubic nitrate	1888	89,477.01	2,449,639	27.38
	1889	75,574.99	2,275,093	30.10
	1890	102,381.92	2,709,131	26.48
	1891	109,862.56	2,929,760	26.67
	1892	117,982.45	2,976,818	25.23
	1893	104,648.94	3,063,012	29.27
	1894	98,719.04	2,785,073	28.21
	1895	138,953.92	4,124,711	29.68
	1896	145,456.64	3,870,734	26.61
	1884	9,842.67	85,086	8.64
	1885	10,897.00	223,292	20.49
	1886	21,364.66	358,170	16.76
	1887	23,381.35	323,704	13.84
	1888	16,948.80	250,844	14.80
	1889	28,149.67	348,521	12.38
All substances not otherwise specified	1890	21,277.38	333,109	15.66
	1891	14,792.45	221,467	14.97
	1892	21,625.50	398,655	18.43
	1893	25,042.68	445,286	17.78
	1894	25,652.00	393,075	15.32
	1895	27,103.00	374,646	13.82
	1896	40,259.95	460,160	11.43

TABLE 8.—Imports of fertilizers and fertilizer materials, 1884 to 1896—Continued.

SUMMARY.

Year.	Tons.	Value.	Value per ton.
1884	279,871.13	\$4,815,933	.....
1885	225,247.33	4,023,020	.....
1886	282,490.77	5,018,072	.....
1887	284,688.18	5,252,491	.....
1888	259,088.01	4,698,777	.....
1889	324,749.60	5,589,374	.....
1890	301,970.98	5,468,446	.....
1891	351,750.08	6,643,993	.....
1892	359,580.95	6,494,698	.....
1893	312,135.37	6,738,384	.....
1894	313,015.52	6,079,419	.....
1895	362,747.28	7,731,148	.....
1896	375,733.93	7,376,615	.....
Total	4,033,069.13	75,930,370	.....

SUMMARY FOR ARTICLES REPRESENTED BY TONS.

1884		\$4,600,355	\$16.44
1885		3,836,797	17.03
1886		4,679,319	16.56
1887		5,151,961	18.10
1888		4,455,463	17.20
1889		5,228,079	16.10
1890		5,081,499	16.83
1891		6,266,864	17.82
1892		6,090,136	16.94
1893		6,229,089	19.96
1894		5,699,747	18.21
1895		7,347,383	20.25
1896		7,154,611	19.04
Total		71,821,303	17.81

TABLE 9.—Exports of fertilizers from the United States, 1884 to 1896.

Year.	Tons.	Value.	Value per ton.
1884	161,352	\$1,096,021	\$6.79
1885	136,976	910,778	6.65
1886	173,031	1,107,657	6.40
1887	220,792	1,397,534	6.33
1888	194,271	1,255,028	6.46
1889	129,539	988,569	7.63
1890	227,593	1,618,681	7.11
1891	231,915	2,182,274	9.41
1892	251,104	2,657,120	10.58
1893	460,062	3,927,343	8.54
1894	542,718	5,038,445	9.28
1895	638,586	5,741,262	8.99
1896	514,143	4,400,593	8.56

FERTILIZERS AND PROFIT IN COTTON RAISING.

Table 10 is one which should be of great interest to farmers, especially to those engaged in cotton raising. It expresses some of the results of an investigation by this Department of the cost of raising cotton. Numerous reports were made by cotton planters, and among other things they stated the cost of the fertilizer used in raising cotton in 1896 on one average acre under cotton cultivation, and also stated

in detail the other items of expense and the income received from the cotton and seed.

Returns were received from 1,495 planters who used commercial fertilizers, and who expended for them various amounts per acre, some of the planters making a net profit and some suffering a loss. Those who made a profit have been separated from those who lost, and each class has been tabulated according to the amount of expense for fertilizers, as shown in Table 10.

INCREASE OF PROFIT WITH INCREASE OF FERTILIZERS.

It appears that there were 21 planters who spent less than \$1 each per acre for fertilizers, and that their average profit was \$4.62 per acre. The planters who spent from \$1 to \$1.99 per acre for fertilizers had an average profit of \$5.09 per acre; those who spent from \$2 to \$2.99 had an average profit of \$5.34; those who spent from \$3 to \$3.99 had an average profit of \$5.91; those who spent from \$4 to \$4.99 had an average profit of \$7.96; those who spent from \$5 to \$5.99 had an average profit of \$8.76; while the planters whose fertilizers cost them per acre \$6 and over, had an average net profit per acre of \$12.51.

It will thus be noticed that increase of expense for fertilizer in cotton raising apparently leads to increase of profit, and further, that, as far as this table discloses, the point of diminishing returns was not reached in the total for the five States that are included, and where it was reached, apparently, in any State, the result is probably a chance one due to the small number of returns.

LOSSES BY USE OF FERTILIZERS.

In the case of the planters who lost it is equally true that increase of expense for fertilizer was accompanied by increase of loss, and while at first this may seem antagonistic to the conclusions warranted for the planters who made a profit, in reality it confirms them. The planters who lost did so because of more or less crop failure due principally to drought, in which case, as is well known, the effect of the fertilizer is to "burn" the plants. Had these crops been raised under normal conditions losses would have been gains, although not necessarily equivalent ones.

An examination of Table 10 will lead to a comparison of profit in cotton raising with expense for fertilizers for South Carolina, Georgia, Florida, North Carolina, and Alabama, and with separation of sea island from upland cotton.

TABLE 10.—*Relationship between the average cost of fertilizers and profit or loss in raising cotton in 1896.*

Classification of cost of fertilizers.	South Carolina.								
	Sea island.			Upland.			Total.		
	Number of farms reporting.	Average cost of fertilizers.	Average profit or loss.	Number of farms reporting.	Average cost of fertilizers.	Average profit or loss.	Number of farms reporting.	Average cost of fertilizers. (a)	Average profit or loss.
PROFIT.									
Under \$1				1	\$0.75	\$8.54	1	\$0.75	\$8.54
\$1 and under \$2	1	\$1.80	\$8.71	28	1.50	4.64	29	1.51	4.78
\$2 and under \$3				76	2.17	5.43	76	2.17	5.43
\$3 and under \$4	2	3.00	20.26	21	3.21	6.36	23	3.19	7.56
\$4 and under \$5				22	4.18	8.64	22	4.18	8.64
\$5 and under \$6	3	5.50	20.54	13	5.12	8.06	16	5.19	10.40
\$6 and over	8	10.06	30.06	12	7.95	11.09	20	8.79	18.68
Total	14	7.48	25.10	173	3.05	6.43	187	3.37	7.83
LOSS.									
Under \$1				1	1.50	.90	1	1.51	.90
\$1 and under \$2				3	2.17	1.75	3	2.17	1.75
\$2 and under \$3				2	3.21	2.00	2	3.19	2.00
\$3 and under \$4				1	4.18	.42	1	4.18	.42
\$4 and under \$5				1	5.12	1.58	1	5.19	1.58
\$5 and under \$6									
\$6 and over									
Total				8	3.05	1.52	8	3.37	1.52

Classification of cost of fertilizers.	Georgia.								
	Sea island.			Upland.			Total.		
	Number of farms reporting.	Average cost of fertilizers.	Average profit or loss.	Number of farms reporting.	Average cost of fertilizers.	Average profit or loss.	Number of farms reporting.	Average cost of fertilizers.	Average profit or loss.
PROFIT.									
Under \$1				6	\$0.70	\$4.42	6	\$0.73	\$4.42
\$1 and under \$2				116	1.42	4.05	116	1.42	4.05
\$2 and under \$3	12	\$2.22	\$9.86	277	2.18	4.87	289	2.18	5.07
\$3 and under \$4	1	3.50	10.10	34	3.16	5.63	35	3.17	5.76
\$4 and under \$5	3	4.19	1.91	19	4.11	8.35	22	4.12	7.47
\$5 and under \$6	2	5.00	3.50	11	5.16	10.32	13	5.13	9.27
\$6 and over	1	10.00	8.49	12	7.47	8.62	13	7.67	8.61
Total	19	3.27	7.88	475	2.30	5.08	494	2.34	5.18
LOSS.									
Under \$1	1	.90	1.91				1	.73	1.91
\$1 and under \$2				17	1.42	1.28	17	1.42	1.28
\$2 and under \$3	1	2.22	4.04	47	2.18	1.36	48	2.18	1.42
\$3 and under \$4	1	3.50	.79	4	3.16	1.07	5	3.17	1.01
\$4 and under \$5	1	4.19	1.70	1	4.11	2.10	2	4.12	1.90
\$5 and under \$6	1	5.00	4.90	1	5.16	2.64	2	5.13	3.77
\$6 and over									
Total	5	3.27	2.67	70	2.30	1.35	75	2.34	1.44

a In computing the average cost of fertilizers per acre, the farms suffering a loss have been combined with those that made a profit, hence some disagreements, which are not errors, between this column and the similar column under "sea island" and "upland," in this table.

TABLE 10.—*Relationship between the average cost of fertilizers and profit or loss in raising cotton in 1896—Continued.*

Classification of cost of fertilizers.	Florida.								
	Sea island.			Upland.			Total.		
	Num-ber of farms report-ing.	Aver-age cost of ferti-lizers.	Aver-age profit or loss.	Num-ber of farms report-ing.	Aver-age cost of ferti-lizers.	Aver-age profit or loss.	Num-ber of farms report-ing.	Aver-age cost of ferti-lizers.	Aver-age profit or loss.
PROFIT.									
Under \$1.....	5	\$0.80	\$2.22	.....	.....	.....	5	\$0.81	\$2.22
\$1 and under \$2.....	12	1.40	9.10	12	\$1.33	\$4.25	24	1.37	6.67
\$2 and under \$3.....	12	2.21	7.71	16	2.28	4.66	28	2.25	5.97
\$3 and under \$4.....	9	3.00	5.86	2	3.00	1.30	11	3.00	5.03
\$4 and under \$5.....	1	4.10	4.30	1	4.00	7.35	2	4.07	5.82
\$5 and under \$6.....	7	5.00	13.71	.....	.....	.....	7	5.00	13.71
\$6 and over.....	2	15.50	22.75	2	9.50	16.90	4	12.50	19.82
Total.....	48	2.86	8.57	33	2.34	5.13	81	2.64	7.17
LOSS.									
Under \$1.....	.....	.....	.....	1	.85	1.72	1	.81	1.72
\$1 and under \$2.....	5	1.40	1.52	2	1.33	.85	7	1.37	1.33
\$2 and under \$3.....	9	2.21	2.65	9	2.28	1.77	18	2.25	2.21
\$3 and under \$4.....	1	3.00	7.47	.....	.....	.....	1	3.00	7.47
\$4 and under \$5.....	1	4.10	11.65	.....	.....	.....	1	4.07	11.65
\$5 and under \$6.....	2	5.00	5.08	.....	.....	.....	2	5.00	5.08
\$6 and over.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	18	2.86	3.37	12	2.34	1.61	30	2.64	2.67

Classification of cost of fertilizers.	North Carolina.			Alabama.			Average for the five States.			
	Num-ber of farms report-ing.	Aver-age cost of ferti-lizers.	Aver-age profit or loss.	Num-ber of farms report-ing.	Aver-age cost of ferti-lizers.	Aver-age profit or loss.	Num-ber of farms report-ing.	Aver-age cost of ferti-lizers.	Aver-age profit or loss.	Per-cent- age of in-crease of profit or loss.
										
PROFIT.										
Under \$1.....	.....	.....	.....	9	\$0.68	\$3.28	21	\$0.74	\$4.62	.....
\$1 and under \$2.....	32	\$1.38	\$5.66	90	1.34	4.27	291	1.40	5.09	10.2
\$2 and under \$3.....	153	2.21	5.27	110	2.18	4.97	656	2.20	5.34	4.9
\$3 and under \$4.....	24	3.14	5.18	25	3.15	6.02	118	3.13	5.91	10.7
\$4 and under \$5.....	32	4.16	5.93	4	4.01	11.92	82	4.11	7.96	34.7
\$5 and under \$6.....	9	5.14	5.43	4	5.22	4.98	49	5.14	8.76	10.1
\$6 and over.....	13	7.23	7.80	1	9.36	7.66	51	9.11	12.51	42.8
Total.....	263	2.80	5.52	2.43	2.05	4.88	1,268	2.52	5.71	.....
LOSS.										
Under \$1.....	.....	.....	.....	1	.68	.81	3	.74	1.48	.....
\$1 and under \$2.....	10	1.38	1.64	25	1.34	2.37	60	1.40	1.50	1.4
\$2 and under \$3.....	15	2.21	2.33	42	2.18	1.72	126	2.20	1.89	26.0
\$3 and under \$4.....	4	3.14	1.82	4	3.15	1.47	16	3.13	2.75	45.5
\$4 and under \$5.....	2	4.16	1.62	3	4.01	2.86	9	4.11	3.69	34.2
\$5 and under \$6.....	1	5.14	3.00	1	5.22	6.02	7	5.14	3.89	5.4
\$6 and over.....	5	7.23	1.98	1	9.36	5.92	6	9.11	3.95	1.5
Total.....	37	2.80	2.02	77	2.05	2.06	2.27	2.52	1.91	.....

ANALYSIS OF FERTILIZERS AND LICENSE OF SALES.

All the States east of the Mississippi River, with Missouri, Arkansas, and Louisiana—twenty-nine in number—have laws relating to the inspection and sale of commercial fertilizers. The region subject to this legislation is the fertilizer-consuming region of the country, the remainder of the States using comparatively insignificant quantities. The occasion for this legislation was the fraudulent character of the commercial fertilizers manufactured and offered for sale, the chemical constituents of which were misrepresented or concealed and were of much less value than represented by manufacturers and dealers.

The laws of the various States with regard to the sale of fertilizers differ only in minor details, and in general are of the following character:

THE GENERAL SYSTEM.

The secretary of the State board of agriculture, or some other State official, is authorized to issue licenses for the sale of fertilizers, upon the payment of a fee for each brand or specified quantity, annually, and the licensee must affix to each package of fertilizer sold, a statement of the chemical analysis of the fertilizer, his own name and address, and the net weight of the package, a copy of said certificate to be sent to the State official, together with a sample of the fertilizer. The State official employs a chemist to analyze samples of fertilizers, and the results of analyses are published, together with statements of the commercial value of the various brands as shown by the quantities of their various components. A regular analysis of each brand of fertilizer is usually made annually, but the State official may authorize anyone to select from any package of fertilizer exposed for sale a small quantity and send the same to him for analysis, to see whether it agrees with the certificate attached to the package.

The result of the legislation requiring the analysis of fertilizers has been to eliminate fraud from the business, and the farmer may now be sure that he is buying what the fertilizer is represented to be, his main concern being that he should buy the fertilizer that is chemically adapted to the requirements of his soil and crop.

ABSTRACT OF FERTILIZER LAWS.

ALABAMA.

Certificate must be attached to each package of 200 pounds or less, and one additional certificate to each package containing each additional 200 pounds or fractional part thereof. The certificate must state the number of pounds contained in the package, the name of the manufacturer and place of manufacture, and give an analysis showing portions of nitrogen, water soluble phosphoric acid, citrate soluble phosphoric acid, acid soluble phosphoric acid, and potash contained therein.

The exemptions from the fertilizer law are common lime, land plaster, cotton seed, cotton-seed meal, ashes, and common salt, not in combination.

The license fee is \$1 for each 200 pounds or fractional part thereof.

Any person selling, or offering for sale, any fertilizer without first submitting the statement required by law to the Commissioner of Agriculture, is to be fined not more than \$500, and anyone who sells fertilizer which does not have a certificate attached for each 200 pounds, or fraction thereof, must be fined not less than \$50. No unlicensed person can deal in fertilizers without being subject to a fine of not less than \$100, and anyone who commits a fraud in the manufacture or sale of fertilizers must be fined not less than \$100.

ARKANSAS.

The percentage of ammonia, potash, and soluble, reverted and insoluble phosphoric acid must be stated in the certificate of analysis.

A fine of \$100 is to be paid for each violation of the law.

For each brand an analysis fee of \$15 is charged.

The law exempts fertilizers worth \$10 and less per ton from the provisions of the fertilizer act.

CONNECTICUT.

Certificate must be attached to each package of fertilizer, showing the number of net pounds of fertilizer contained therein, the name, brand, or trade-mark under which the fertilizer is sold, the name and address of the manufacturer, and the place of manufacture, and the chemical composition of the fertilizer.

Fertilizers exempted from the law are stable manure and locally manufactured products having a less value than \$10 a ton.

The law forbids the sale of pulverized leather, raw, steamed, roasted, or in any form, as a fertilizer without explicit printed certificate of the fact affixed to every package.

The license fee is \$10 for each of the fertilizing ingredients contained or claimed to exist in said fertilizer, and every violator of the law is subject to a fine of \$100 for the first offense and \$200 for each subsequent violation.

DELAWARE.

Marl, barnyard manure, lime, ashes, plaster, and chemicals used in compounding fertilizers are exempt from the provisions of the law.

The percentage of ammonia, of potash soluble in water, of available phosphoric acid, and of insoluble phosphoric acid must be stated in the certificate of analysis.

Any misstatement of analysis is subject to a penalty of \$200 for the first offense and \$300 for each subsequent one, while a failure to send a copy of the certificate of analysis to the State chemist subjects the offender to a fine of \$100 for the first offense and \$150 for each subsequent one.

For each brand a fee of \$30 is paid.

FLORIDA.

The exemptions are barnyard or stable manure, crude cotton seed, marl, lime, plaster, and chemicals to be used in compounding artificial manures.

The certificate of analysis must state the percentage of ammonia, potash soluble in water, available phosphoric acid, and the source from which the same is derived, and the insoluble phosphoric acid, and all other ingredients of which the fertilizer is composed.

For misrepresenting the analysis the penalty is \$200 for the first offense and \$300 for each subsequent one, and the penalty for failure to file a certificate of analysis with the Commissioner of Agriculture is \$100 for the first offense and \$150 for each subsequent one.

The fee is 25 cents per ton.

GEORGIA.

The certificate to be filed with the State official is to show the proportions of the ingredients, as follows: Moisture at 212° F., insoluble phosphoric acid, available phosphoric acid, ammonia, actual and potential, potash (K_2O).

The law forbids the sale of the following: Any acid phosphate which contains less than 10 per cent of available phosphoric acid; any acid phosphate with potash which contains a sum total of less than 10 per cent of available phosphoric acid and potash when the percentages of the two are added together; any acid phosphate with ammonia which contains a sum total of less than 10 per cent of available phosphoric acid and ammonia when the percentages of the two are added together; any acid phosphate with ammonia and potash which contains a sum total of less than 10 per cent of available phosphoric acid, ammonia, and potash when the percentages of the three are added together; all cotton-seed meal which is shown by official analysis to contain less than $7\frac{1}{2}$ per cent of ammonia. No brands shall be sold as ammoniated superphosphates unless said brands contain 2 per cent or more of ammonia.

The license fee is 10 cents per ton and the penalty is that of a misdemeanor.

ILLINOIS.

A certificate must show a chemical analysis stating the percentage of nitrogen, or its equivalent in ammonia, in available form, of potash soluble in water, and of phosphoric acid in available form (soluble or reverted), as well as the total phosphoric acid.

The license fee is \$20 for each manufacturer, importer, or agent, but the law does not apply to fertilizers, the price of which is \$10 a ton or less.

The penalty for violation is a fine of not less than \$200 for the first offense, and not less than \$500 for every subsequent one, but a deficiency of 1 per cent or less of the nitrogen, potash, or phosphoric acid claimed to be contained is not considered as evidence of fraudulent intent.

INDIANA.

The analysis must show in an available form the percentage of nitrogen or its equivalent in ammonia, of potash soluble in water, of soluble and reverted phosphoric acid, and of insoluble phosphoric acid.

The exemptions from the law are barnyard manure, marl, lime, wood ashes, and plaster.

A violator of the law pays \$50 for the first offense and \$100 for each subsequent one.

Each analysis calls for a fee of \$2, and labels must be obtained from the State officials at \$1 per hundred.

KENTUCKY.

Such analysis must be made as is approved by the director of the Kentucky Agricultural Experiment Station, and the label that must be attached to each package must state the money value of the contents, computed from their composition.

The law does not apply to fertilizers worth \$10 and less per ton.

The fee for each analysis is \$15, and besides this the vender must obtain labels from the State official and pay \$1 per hundred.

For each violation of law the penalty is not less than \$100 nor more than \$500.

LOUISIANA.

The certificate of chemical analysis must state the proportions of nitrogen, soluble phosphoric acid, reverted phosphoric acid, insoluble phosphoric acid, and potash, with such additional ingredients as the fertilizer may contain.

The inspection fee is 50 cents per ton. The person who sells fertilizers without a license is subject to a fine not exceeding \$1,000, while a person who sells fertilizer which has not been tagged, although having a license, is guilty of a misdemeanor and subject to a fine of \$250 for each offense and \$150 for each omitted tag. The sale of fraudulent fertilizers is forbidden, suits at law can not be maintained for collecting the price thereof, and all fertilizers not legally tagged are presumed to be fraudulent.

The law is not applicable to lime, land plaster, cotton-seed meal, ashes, and common salt.

MAINE.

The law does not apply to fertilizers worth \$10 and less per ton. The required certificate of analysis is the same as that for Illinois, and continues from year to year unless a change is made in the composition of the fertilizer.

A fee of \$10 must be paid for the phosphoric acid, and of \$5 each for the nitrogen and potash, for each brand of which 30 tons or more are sold.

The penalty for violation of law is \$100 for the first offense and \$200 for each subsequent one, with the proviso that the percentages of ingredients must be substantially smaller than those claimed by the vender.

MARYLAND.

In the certificate of analysis there must be a statement of the percentage of nitrogen, or its equivalent in available ammonia, of potash soluble in distilled water, and of available phosphoric acid.

The fee is \$15 per brand, but the act does not apply to fertilizer materials, nor to special contracts.

The penalty for selling without a license is \$100 for the first offense and \$200 for each subsequent one; for adulterating or changing the constituents of fertilizers as certified, or for using another manufacturer's trade-mark, the penalty is a fine of not more than \$200, or imprisonment not exceeding six months, or both; the penalty for not reporting brands and agents to the Maryland Agricultural College is \$25 for the first offense and \$50 for each subsequent offense.

The law does not apply to fertilizers selling for \$10 or less per ton.

MASSACHUSETTS.

A chemical analysis must be made from which to state the percentage of nitrogen, of potash soluble in distilled water, and of phosphoric acid in available form (soluble in distilled water and reverted), as well as the total phosphoric acid.

No one is to sell any pulverized leather, hair, or wool waste, raw, steamed, roasted, or in any form, as a fertilizer, without an explicit printed certificate of the fact affixed to every package.

Penalty for violation of law is \$50 for the first offense and \$100 for each subsequent one.

There is an analysis fee of \$5 each for nitrogen, phosphorus, and potassium.

MICHIGAN.

The law is applicable to fertilizers which exceed \$10 per ton in value. Certificate of analysis to state the percentage of nitrogen in an available form, of potash soluble in water, of phosphoric acid in available form (soluble and reverted), and of insoluble phosphoric acid.

The license fee is \$20 for every brand, and the penalty for violation of law is a fine of not less than \$100 for the first offense, and not less than \$300 for each subsequent one.

MISSISSIPPI.

The exemptions from the provisions of the fertilizer law are animal excrement, cotton seed, and unmixed cotton-seed products, whether natural or artificial.

In the statement of analysis there must be mentioned the percentage of nitrogen in available form, of potash soluble in water, and of phosphoric acid in available form, soluble or reverted, and of insoluble phosphoric acid.

Adulterated fertilizer, or that which does not conform to the certificate, is to be forfeited to the county, and contracts for it are void. Counterfeiting or using false tags is forgery.

For each analysis there is a fee of \$15, and the charge for tags enough for 1 ton of fertilizer is 30 cents.

MISSOURI.

The approval of the director of the Missouri Agricultural Experiment Station must be given to the form of analysis, which must state the essential ingredients of the fertilizer in plain language and be void of all technical terms. The label must state, also, the money value of the fertilizer, computed from its composition.

Each analysis calls for a fee of \$10, and the labels are \$1 per hundred.

For the first offense against the law the penalty is \$100; for each subsequent one \$200.

NEW HAMPSHIRE.

The percentage of ammonia, nitrogen, soluble phosphoric acid, insoluble phosphoric acid, potash, and other constituent parts must be shown in the certificate of analysis.

For a license to sell fertilizers a fee of \$50 must be paid, and for selling without a license \$500 must be paid, one-half of which goes to the prosecutor. For want of a label on each package, or for a false statement on a label, the fine is \$20 for the first offense and \$10 for each subsequent one, one-half to go to the prosecutor.

NEW JERSEY.

The certificate of analysis must state the percentage of ammonia, or its equivalent of nitrogen; of potash in any form or combination, soluble in distilled water; of phosphoric acid in any form or combination; of portion of phosphoric acid soluble in distilled water; that portion soluble in a neutral solution of citrate ammonia at a temperature not exceeding 100° F., and that portion of phosphoric acid not soluble in either of the above-named fluids. The material from which the phosphoric acid is obtained must also be stated. This certificate of analysis must accompany every package of over 100 pounds.

The license fee is \$15 for each analysis, and the penalty for violation of law is \$50 for the first time and \$100 for each subsequent time.

NEW YORK.

The law requires that the statement of analysis shall exhibit the percentage of nitrogen; available phosphoric acid, or in case of undissolved bone, percentage of total phosphoric acid; percentage of potash soluble in distilled water.

It is to be regarded as a violation of law if the number of pounds in a package is less than that certified, if the name and address of the manufacturer or name of the brand of fertilizer is misstated, and, in case of undissolved bone, if there is less than 1 per cent of total phosphoric acid.

The penalty for violation of law is \$100.

Fertilizers selling for \$10 and less per ton are exempt from the operation of the law.

No license fee is provided for.

NORTH CAROLINA.

Cotton-seed meal is not subject to the law.

In the certificate of analysis there must be a statement of the soluble and precipitated phosphoric acid, which should not be less than 8 per cent; the ammonia, which should not be less than 2 per cent, or its equivalent in nitrogen.

A tax of 25 cents is placed upon each ton.

Any fertilizer not up to the requirements of the law in composition, or any untagged fertilizer, is subject to seizure and sale by order of court.

The penalty for violating the law is \$10 for each package.

OHIO.

A chemical analysis must show the percentage of nitrogen, or its equivalent in ammonia, in available form; of potash soluble in water, and of phosphoric acid in available form (soluble or reverted), as well as the total phosphoric acid.

The license fee is \$20 for each brand, and the penalty for violation of law is a fine of not less than \$200 for the first offense and of not less than \$500 for each subsequent one.

PENNSYLVANIA.

The certificate of chemical analysis must state the percentage of nitrogen, or its equivalent in ammonia, in available form; of potash, soluble in water; of soluble and reverted phosphoric acid, and of insoluble phosphoric acid.

The fee is \$10 for each article of fertilizer sold during the preceding year if the amount sold was less than 100 tons; if the amount was 100 tons and over, but less than 500 tons, the fee is \$20; and if the amount was 500 tons or more it is \$30; but if no sales were made in the preceding year the fee is \$10.

The penalty for violation of law is a fine of not less than \$25 nor more than \$100 for the first offense, and not less than \$200 for each subsequent offense, half of which goes to the informer.

The law does not cover barnyard manure, marl, lime, and wood ashes, nor any commercial fertilizer which contains none of the constituents to be mentioned in the certificate of the chemical analysis.

RHODE ISLAND.

The exemptions from the law are fertilizers worth less than \$10 per ton, except that packages of such fertilizers must be accompanied by a label giving a correct statement of composition.

The analysis certificate to state the percentage of nitrogen, of potash (K_2O) soluble in distilled water, and of soluble, reverted and insoluble phosphoric acid (P_2O_5).

For each ingredient of the fertilizer the license fee is \$6.

The first violation of the law subjects the offender to a fine of \$50; each subsequent one \$100.

Pulverized leather must bear a printed certificate that it is pulverized leather.

SOUTH CAROLINA.

All chemical compounds for use as fertilizers are covered by the law, including "burnt marl, kainit, ground bone, fish scrap, tankage, cotton-seed meal, etc."

The chemical analysis must show the real percentage of soluble and precipitated phosphoric acid, soluble potassa, ammonia, or its equivalent in nitrogen.

A tax of 25 cents per ton must be paid.

For violating the fertilizer law there is a penalty of \$10 for each package.

TENNESSEE.

A certificate of analysis must show the percentage of ammonia, potash, and available phosphoric acid in such form as may be prescribed by the Commissioner of Agriculture.

A fee of 50 cents must be paid on each ton or fraction of a ton sold.

The law does not apply to home-made manures.

A fine of \$200 must be paid upon conviction of violation of the law, except that failure to send a sample of the fertilizer received by a dealer to the Commissioner of Agriculture subjects the former to a fine of not less than \$50 or more than \$100.

VERMONT.

The law applies to fertilizers containing two or more of the following elements: Nitrogen, ammonia, potash, and phosphoric acid.

The exemptions from the law, in addition to those indicated by the preceding, are bone meal, land plaster, lime, or any substance or product of nature not compounded, and fertilizers worth less than \$10 per ton.

The analysis certificate must state the percentage of nitrogen, of potash soluble in distilled water, and of phosphoric acid in available form, soluble in distilled water and reverted, as well as total phosphoric acid. The fee for a license to sell is \$100.

Pulverized leather must bear a printed certificate of its nature.

For first violation of law the penalty is \$50 and for each subsequent one \$100.

VIRGINIA.

A registration fee of \$100 is required, which entitles a manufacturer or dealer to register not exceeding ten brands; each brand above ten calls for a fee of \$10, but anyone manufacturing not more than 100 tons in one year pays a tax of \$10 only. The certificate of analysis must show the percentage of ammonia, available phosphoric acid, insoluble phosphoric acid, and potash soluble in water, and any other ingredient.

One who sells fertilizer without having a license is subject to a fine not exceeding \$1,000, and anyone who does not attach to each package a statement of the analysis may be fined not less than \$50 in each case.

The law does not apply to lime, land plaster, ashes, common salt, nor to any chemicals used in manufacturing fertilizers.

WEST VIRGINIA.

The prescribed certificate of analysis must make the same statement as that called for by the law of Illinois, and in addition to this there must be written or printed on the label the value per ton, to be computed from the composition of the fertilizer.

The making of a false certificate to the director of the West Virginia Agricultural Experiment Station is perjury. The penalty for sale without analysis, as provided, is \$50 to \$500, and the penalty for removing, altering, or transferring the label, or selling without a label, is \$10 to \$50; for any other violation, \$10 to \$100.

There is a fee of \$10 for each fertilizer ingredient and 50 cents per hundred labels.

WISCONSIN.

The law applies to fertilizers which are worth more than \$10 per ton, and the certificate of analysis is the same as that required in Illinois.

The license fee is \$25 per brand, and the penalty for violation of law is \$100 for the first offense and \$200 for each subsequent one.

TITLES AND ADDRESSES OF FERTILIZER-INSPECTION OFFICIALS.

[The titles are not in all cases those of the officials charged by law with the licensing of the sale of fertilizers, but they are the titles of the persons to be addressed for information and business with regard to fertilizers.]

- Alabama.—Commissioner of Agriculture, Montgomery.
 Arkansas.—State Chemist, Arkansas Industrial University, Fayetteville.
 Connecticut.—Director, Agricultural Experiment Station, New Haven.
 Delaware.—State Chemist, Delaware College Agricultural Experiment Station, Newark.
 Florida.—Commissioner of Agriculture, Tallahassee.
 Georgia.—Commissioner of Agriculture, Atlanta.
 Illinois.—Secretary of the Board of Agriculture, Springfield.
 Indiana.—State Chemist, Purdue University, Lafayette.
 Kentucky.—Director, Agricultural Experiment Station, Lexington.
 Louisiana.—Commissioner of Agriculture and Immigration, Baton Rouge.
 Maine.—Director, Agricultural Experiment Station, Orono.
 Maryland.—State Chemist, Maryland Agricultural Experiment Station, College Park.
 Massachusetts.—State Chemist, Hatch Agricultural Experiment Station, Amherst.
 Michigan.—State Chemist, Michigan Agricultural College, Agricultural College.
 Mississippi.—State Chemist, Mississippi Agricultural and Mechanical College, Agricultural College.
 Missouri.—Director, Agricultural Experiment Station, Columbia.
 New Hampshire.—Secretary of the State Board of Agriculture, Concord.
 New Jersey.—Director, New Jersey Agricultural Experiment Station, New Brunswick.
 New York.—Director, New York Agricultural Experiment Station, Geneva.
 North Carolina.—Commissioner of Agriculture, Raleigh.
 Ohio.—Secretary of the Board of Agriculture, Columbus.
 Pennsylvania.—Secretary of Agriculture, Harrisburg.
 Rhode Island.—Secretary of the Board of Agriculture, Providence.
 South Carolina.—Secretary, Fertilizer Department, Clemson College.
 Tennessee.—Commissioner of Agriculture, Nashville.
 Vermont.—Director and Chemist of the Agricultural Experiment Station, Burlington.
 Virginia.—Commissioner of Agriculture, Richmond.
 West Virginia.—Director, West Virginia Agricultural Experiment Station, Morgantown.
 Wisconsin.—Chief Chemist, Agricultural Experiment Station, Madison.

